Annexure – I

Syllabus for B.Tech. III Semester

B.Tech – Electronics & Instrumentation Engineering

Scheme

Sr. No.	Course Code	Course Name	L	T	P	Credit
1	EI3BS03	Engineering Mathematics-III	3	1	0	4
2	EI3CO01	Signals and Systems	3	0	0	3
3	EI3CO03	Electronic Devices and Circuits	4	0	2	5
4	EI3CO05	Circuit Analysis and Synthesis	3	1	2	5
5	EI3CO07	Digital Electronics	3	0	2	4
6	EI3CO15	Instrumentation Engineering Workshop	0	0	2	1
7	EI3ES09	Engineering Materials	3	0	0	3
8	EN3MC01	Self Study	0	0	1	0
		Total	**19**	**2**	**9**	25
		Total Contact Hours	30			

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Course Code	Course Name	Hours per Week			Total Credits
		L	T	P	
EI3BS03	Mathematics-III	3	1	0	4

UNIT I GRAPH THEORY-I

Basic definitions of Graphs, Isomorphism, Walk, Path, Circuit, connectivity of a graph, cut points, cycles, Hamiltonian graphs, sub graphs, spanning sub graphs, isomorphic graphs, Digraphs(basic definitions of digraphs), Matrix Representation of Graphs (Adjacency, Incidence Matrices and Circuit Matrix).

UNIT II GRAPH THEORY-II

Weighted graph, Shortest Path in a weighted graph: Dijkstra's Algorithm, Tree, Properties of Tree, Binary Tree, Fundamental Circuit, Minimal Spanning Tree: Kruskal's Algorithm, Prim's Algorithm, Ford-Fulkerson Algorithm for Maximum Flow; Max Flow – Min Cut Theorem. Cut Set, Fundamental Cut Set and Cut Vertices, Application of graphs in network flows.

UNIT III SPECIAL FUNCTIONS:

Series solutions ordinary differential equations, Solution of Bessel and Legendre differential equation, Bessel functions, Legendre functions, recurrence relations, orthogonality properties, Ber and Bei functions.

UNIT IV FUNCTIONS OF RANDOM VARIABLE:

Expectation, Variance, Moments, Characteristic functions Problems, joint moments, joint characteristic functions, conditional distributions, conditional expected values, Random Process concept, Stationarity and independence. Distribution and density of a sum of random variables, Central limit theorem. The random process concept, Stationarity and independence,ergodicity.

UNIT V STATISTICS

Correlation, Karl Pearson's Coefficient of Correlation,Spearman's Rank Correlation Coefficient , Linear Regression, Regression coefficients ,Curve fitting (Method of Least Square),Testing of Hypothesis , Student's t-test, Fisher's z-test, Chi-Square test.

TEXT BOOKS:

1. Davenport, "Probability and Random Processes for Scientist and Engineers", McGraw-Hill.
2. Kishor S Trivedi, "Probability and Statistics with Reliability, Queuing and Computer Applications", Prentics Hall of India.
3. Rathor, Choudhari,: Descrete Structure And Graph Theory.
4. Advanced Engineering Mathematics: by Erwin Kreyszig, John Wiley and Sons.
5. Martin Vetterli, Jelena Kovacevic, "Wavelets and Subband Coding", Prentice Hall Inc.

REFERENCE BOOKS:

1. Hwei P. Hsu, "Theory and Problems of Probability, Random Variables, and Random Processes", schaum series. TMH.
2. Murray R. Spiegel, "Probability and Statistics", McGrawHll, Schaum's Outline Series.
3. A. Papoulis and S. Unnikrishna Pillai, "Probability, Random Variables and Stochastic Processes, McGrawHill, 4th Edition.
4. Richard A Johnson, "Probability and Statistics for Engineers", Prentice hall, India.
5. Stephen G. Mallat, "A Wavelet Tour of Signal Processing," 2nd Edition, Academic Press.

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Course Code	Course Name	Hours per Week			Total Credits
		L	T	P	
EI3CO01	Signal and System	3	0	0	3

UNIT I SIGNALS:
Basic definition of signals, Classification of Signals, Signal operations & properties, Analogy between Vectors and Signals, Orthogonal Signals, Signal approximation using Orthogonal functions, Mean Square Error, Closed or complete set of Orthogonal functions, Exponential and Sinusoidal signals, Concepts of Impulse function, Unit Step function, Signum function, Case study of different signals from communication field.

UNIT II ANALYSIS OF SIGNALS:
Fourier Series Analysis of CT signals, Fourier Transform, properties of Fourier Transform, Sampling of CT signals & aliasing.
Discrete time signals, Discrete time signal representation using Complex exponential and Sinusoidal components, Periodicity of Discrete time signal. Discrete Time Fourier series and its properties, DTFT and its properties.

UNIT III SYSTEMS:
Basic of systems, system properties: Linearity, Static and dynamic, stability and causality, time invariant and variant system, invertible and non-invertible, representation of continuous systems. Continuous Time LTI System:- Differential Equation, Block Diagram representation, Impulse response and convolution integral, properties of convolution, signal responses to Continuous LTI system.

UNIT IV DISCRETE TIME SYSTEM:
Introduction, Properties of discrete time systems, Impulse response characterization and convolution sum, Properties of convolution sum, Discrete systems described by difference equation, solution of difference equation, Impulse response of DT-LTI system.

UNIT V Z-TRANSFORM:
Concept of Z- Transform of a Discrete Sequence, Two sided and single sided Z- transform, Region of Convergence in Z-Transform, Constraints on ROC for various classes of signals, Inverse Z-transform, Properties of Z-transforms. Solution of difference equation using Z-transform, Relationship between Z-transform and DTFT.

TEXT BOOKS:

1. Alan V. Oppenheim, Alan S. Wilsky and Nawab, Signal & system, Pearson Education.
2. Simon Haykin and Bary Van Veen, Signal & System, Wiley- India Publications
3. B.P.Lathi, Linear Signal & System, Oxford University Press
4. Anand Kumar, "Signal & System", PHI Learning.

REFERENCES:

1 H P Hsu, Rakesh Ranjan, Signal and System, Schaum's Outlines, Tata McGraw Hill, Indian Reprint.
2. Michel J. Robert, "Fundamentals of Signals and Systems" MGH International Edition.

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
EI3CO03	Electronic Devices and Circuits	4	0	2	5

UNIT- I . SEMI-CONDUCTORS AND DIODES:
Introduction, Insulators, semiconductors and metals, Mobility and conductivity, Intrinsic and extrinsic semiconductors, Charge Densities, Hall Effect, Drift and diffusion current Continuity equation.
PN junction diode- Construction of PN junction diode, space charge region, barrier potential and energy hill in PN junction diode. Forward and reverse biasing, V-I characteristics of PN junction, diode resistance and diode junction capacitance, temperature dependency.
Types of diodes- Zener, Photodiodes, LED, Varactor diode, Tunnel diode, Schottky diode. Rectifiers and filter circuit: Half wave rectifier, Full wave rectifier, bridge rectifier and their analysis, L,C and Pi filters, Clippers , Clampers, Regulated supply using zener diode.

UNIT –II BIPOLAR JUNCTION TRANSISTOR:
Construction, basic operation, current components ,CB, CE and CC- configuration, input and output characteristics, Early effect, Region of operations: active, cut-off and saturation region. BJT as an amplifier, Ebers-Moll model, Power dissipation in transistor (P d, max rating).
Transistor biasing circuits and analysis: Introduction, various biasing methods:Fixed bias,Self bias, Voltage Divider bias, Collector to base bias, Load-line analysis: DC and AC analysis, Operating Point , Bias Stabilization and Thermal Runaway.
AC Model: h-parameter model of BJT, Hybrid π model of BJT.

UNIT –III FIELD EFFECT TRANSISTORS
FET : Construction, n-channel and p-channel, transfer and drain characteristics, Equivalent model and voltage gain, analysis of FET in CG, CS and CD configuration. Enhancement and Depletion MOSFET, drain and transfer Characteristics.

UNIT –IV AMPLIFIER AND OSCILLATORS:
Amplifier Types and Analysis: Introduction, Voltage amplifier, current amplifier, transconductance amplifier and transresistance amplifier. Analysis of transistor amplifier using h-parameter model, Single stage RC coupled amplifier.
Multistage Amplifier: Cascading amplifier, Boot-strapping Technique, Darlington amplifier and cas-code amplifier, Coupling methods in multistage amplifier, Low and high frequency response.
LargeSignal analysis and Power Amplifiers:Class A,Class B,Class AB,Class C,Class D, Transformer coupled and Push-Pull amplifier.

UNIT-V FEEDBACK AMPLIFIER AND OSCILLATORS:
Feedback Amplifier: Classification of amplifiers, The Basic concepts of Feedback, Effect of Negative Feedback, Varoius Feedback Topologies,Method Of Identifying Feedback Topology and Feedback Factor , Stability Of Feedback Amplifier.
OSCILLATORS: Criterion for oscillation, Types of oscillators: Hartley oscillator, Colpitt oscillator, RC-phase shift oscillator, Wein bridge oscillator.

TEXTBOOKS

1. Millman and Halkias: Integrated electronics, TMH.
2. Boylestad and Nashelsky: Electronic Devices and Circuit Theory, Pearson Education.

REFERENCES:

1. Sedra and Smith: Microelectronics, Oxford Press.
2. Anil K. Maini, VarshaAgarwal: Electronic Devices and Circuits, Wiley Publications.
3. Donald A Neamen: Electronic Circuits Analysis and Design, TMH
5. Salivahanan: Electronic Circuits Analysis and Design, TMH
6. Mottershead: Electronic Devices and Circuits an introduction, PHI
7. Kumar and Jain: Electronic Devices and Circuits, PHI.
8. David A. Bell Electronic Devices and Circuits Oxford University press.

LIST OF PRACTICALS:

1. To determine and analyze the V-I characteristics of PN Junction diode and Zener diode.
2. To realize and analyze full wave rectifier with different filters.
3. To realize and analyze different clipper and clamper circuits.
4. To determine input and output characteristics of transistor amplifiers in CE, CB & CC Configurations.
5. To determine the frequency response of transistor CE amplifier, direct coupled and RC coupled amplifier.
6. To determineDrain and Transfer Characteristicsof JFET.
7. To determineDrain and Transfer Characteristicsof Enhamncement and Depletion type MOSFET .
8. To determine the frequency response of two stage CE amplifier with direct coupling and RC coupling.
9. To determinecharacteristics of class A and B power amplifiers.
10. Realization of Wein Bridge and RC Phase Shift Oscillator.

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Course Code	Course Name	Hours per Week			Total Credits
		L	T	P	
EI3CO05	Circuit Analysis and Synthesis	3	1	2	5

UNIT-I INTRODUCTION TO CIRCUIT THEORY

Graphs, Tree, Tree branches and links, cut sets, and tie set schedules. Basic circuit element R,L,C elements,Ideal and Practical voltage and current sources,controlled & uncontrolled sources,source transformation,Star and delta conversion, KCL and KVL analysis, Nodal & mesh analysis of circuits containing resistors and independent and dependent sources. Dot convention, coupling coefficient, tuned circuits, series & parallel resonance.

UNIT-II TRANSIENT ANALYSIS AND CIRCUIT THEOREMS

Response of RL,RC and RLC circuits for unit step, ramp, and impulse function. Transients in RL,RC and RLC circuits, initial and final conditions, time constants and steady state analysis.

Linearity of a Circuit and Superposition Theorem, Thevenin's Theorem and Norton's Theorem -Determination of Equivalents for Circuits with Dependent Sources, Reciprocity Theorem , Maximum Power Transfer Theorem , Millman's Theorem, Tellegen's theorem ,Substitution Theorem, Compensation Theorem.

UNIT-III LAPLACE TRANSFORM

Laplace Transform,Properties of Laplace transform, Initial value and Final Value Theorem, Solution of integral and differential equations using Laplace Transform, Time domain analysis of LTI network using Laplace transform, Waveform Synthesis, LT of Complex waveforms,.Concept of Transfer function, Relation between impulse response and system function.

UNIT-IV TWO PORT NETWORK

Two Port Network Analysis: Introduction, z parameters, y- parameters, hybrid parameter, ABCD parameters, condition of reciprocity and symmetry in two port parameter presentation. Interrelationship between parameters of two port networks. Expression of input and output impedance in terms of two port parameter, ladder network, equivalent T and π section representation in parametric form.

UNIT-V NETWORK SYNTHESIS

Synthesis of Passive Networks,Concept of Stability of a System from Pole Zero Concept, Necessary condition of Stability of a Network Function, Hurwitz Polynomial, Properties of Hurwitz Polynomials, Positive Real Function, Concept of Network Synthesis, Reactive Network, Driving Point Immitance of LC Network, LC Network Synthesis, Foster and Cauer form, RC and RL Network Synthesis By Foster and Cauer form.

TEXT BOOKS:

1. M.E Van Valkenburg, Network Analysis, PHI Publication.
2. W H Hayt, J E Kemmerly, S M Durbin, Engineering Circuit Analysis TMH Publication.
3. Franklin S. KUO, Network Analysis & Synthesis, Wiley Publication.
4. Matthew N.O. Sadiku, Fundamentals of Electric Circuits, McGraw-Hill International.

REFERENCE BOOKS:

1. D Roy Choudhary, Network and systems, New Age Pub.
2. Sudhakar, Circuit Network Analysis & Synth, TMH Publication..
3. S P Ghosh, A K Chakraborty Network Analysis & Synth, McGraw-Hill.

WEB

1. http://www.nptelvideos.in/2012/11/networks-signals-and-systems.html

LIST OF PRACTICALS

1. To measure and calculate currents and voltages for a given resistive circuit and verify KCL and KVL.
2. To verify superposition theorem experimentally for a given resistive circuit consisting two independent sources.
3. To verify Thevenin's theorem and Norton's theorem experimentally for a give circuit.
4. To verify maximum power transfer theorem experimentally for a given circuit.
5. To verify reciprocity theorem experimentally for a given circuit.
6. To measure and calculate Z-parameters for a given two-port system.
7. To measure and calculate Y-parameters for a given two-port system.
8. To measure and calculate h-parameters for a given two-port system.
9. To measure and calculate ABCD-parameters for a given two-port system. To measure and calculate RC time constant for a given RC circuit.
10. To measure and calculate RL time constant for a given RL circuit.
11. To Find Frequency Response of RLC Series Circuit RLC parallel Circuit and determine resonance and 3-dB frequencies.

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Course Code	Course Name	Hours per Week			Total Credits
		L	T	P	
EI3CO07	Digital Electronics	3	0	2	4

UNIT- I NUMBER SYSTEM :
Introduction to binary numbers, data representation , binary, octal, hexadecimal number system and their conversion, Various coding schemes such as BCD codes, Excess-3 code, Gray code, Hamming code, error detection and correction. Binary arithmetic, Boolean Algebra, Basic Theorems and properties of Boolean Algebra, Boolean Functions, Canonical and Standard forms, minimization techniques, Sum of products and Product of Sums Simplification, Karnaugh's map method, Quine Mecluskey method.

UNIT II LOGIC GATES AND COMBINATIONAL LOGIC:
Digital Logic Gates such as AND, OR, NAND,NOR, EX-OR,EX-NOR. Realization of Boolean functions using logic gates. Adders, substractors, BCD adder, magnitude comparator, decoders and encoders, multiplexers and demultiplers, code converters. Analysis and design of combinational circuits. Implementation of combinational logic using multiplexers, decoders etc.

UNIT III SEQUENTIAL CIRCUITS:
Introduction, comparison of sequential and combinational circuits. Various types of flip-flops and their conversions, triggering of flip flops, timing issues, setup and hold times, registers, counters, ring, johnson, asynchronous and synchronous. Finite state machines, Moore and Mealy, design of synchronous sequential circuits.

UNIT IV MEMORIES:
ROM, PLA and PAL. Memories : organisation and construction of RAM, SRAM, DRAM, ROM, PROM, EPROM, EEPROM.

UNIT V LOGIC FAMILIES:
DTL, RTL, TTL, IIL, PMOS, NMOS and CMOS logic families, interfacing between TTL and MOS vice-versa.

Text Book:

1. D Roy Chudhury, Digital Circuits, Vol-I & II, Eureka Publication.
2. M. Mano, Digital and Computer Design, Pearson Education.

REFERENCES :

1. Leach and Malvino, Digital Principles and Applications, TMH.
2. Millman and Taub, Pulse, Digital and Switching Waveforms, MGM.
3. A.Anand Kumar: Digital Circuits, PHI.
4. Salivahanam and Ari Vahagan: Digital Circuits and Design, Vikas Publishing House.

LIST OF PRACTICALS

1. To test and study of operation of all logic gates for various IC's
2. Implementation of AND, OR, NOT, XOR and XNOR gates using universal gates.
3. Binary addition by half adder and full adder.
4. Binary substraction by half substractor and full substractor circuit.
5. Design of BCD to excess-3 code converter.
6. Realization of circuit for binary to gray conversion and vice-versa.
7. Verification of Demorgans' theorem.
8. Study of RS, JK, T and D flip flops
9. Realization of 4 bit binary counter.
10. Realization of 4-bit shift register.

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Course Code	Course Name	Hours per Week			Total Credits
		L	T	P	
EI3ES09	Engineering Material	3	0	0	3

UNIT I BASIC

Atomic structure, molecules and general bonding principles, crystal system and structure , Miller indices, Bravais lattice, crystal structure for metallic elements, structural imperfections, dielectric parameters, polarization, static dielectric constant of solids, ferroelectric materials, piezoelectricity, complex dielectric constant, dielectric loss, insulating materials and their properties, composite materials.

UNIT II MAGNETIC MATERIALS

Fundamental concepts pertaining to magnetic fields, magnetic dipole movement of current loops, orbital magnetic dipole movement and angular momentum of simple atomic model, classification of magnetic materials, spin magnetic moment, paramagnetic, ferromagnetism, spontaneous magnetization and Curie-Weiss law, ferromagnetic domains, magnetic anisotropy, magnetostriction, anti-ferromagnetism, ferrites and its applications.

UNIT III CONDUCTORS AND INSULATORS

The resistivity range, free electron theory, conduction by free electrons, conductors and resistor materials, resistivity of metals, Linde's rule, Joule's law, thermal conductivity, Electronic and Ionic conduction, Energy Band structures in solids, Electron Mobility, Temperature variation of conductivity, Superconductivity - The free electron model, thermodynamics and properties of superconductors, Meissner effect, classification of superconductors.

UNIT IV SEMI-CONDUCTING MATERIALS

The energy gap in solids, intrinsic semiconductor, extrinsic semiconductor, Temperature Dependence of Conductivity, Direct and Indirect Band gap. Semiconductors, Hall Effect, mechanism of current flow, drift current, diffusion current, Einstein relation, fabrication of integrated circuits, some semiconductor devices.

UNIT V OPTICAL PROPERTIES OF MATERIALS

Introduction, electromagnetic radiation spectrum, refractive index, reflection, Birefringence, dispersion, absorption, photoelectric emission, electroluminescence, photoconductivity, lasers, ruby lasers, Nd-YAG laser, carbon dioxide laser, optical fibers, fiber materials, fabrication of fiber cables.

TEXT BOOKS:

1. Banerjee- Electrical & Electronics Material,PHI.
2. S. O. Kasap- Priniciple of Electronics Material &Device,TMH.
3. Jones-Material Science for Electrical & Electronics Enginnering,Oxford.
4. V. Raghvan, Material Science & Engineering –, Prentice Hall of India Pvt. Ltd, New Delhi
5. W.D. Callister, Material Science and Engineering-An Introduction, John Wiley & Sons, Delhi.
6. VanVlack, Elements of Material Science and Engineering, Wesley Pub. Comp. Introduction to Engineering Materials: B. Agarwal, McGraw Hill Publication

REFERENCE:

1. J.AllisonElectronicsEnginnering, Material &Device, TMH.
2. Gilmore: Material Science, Cengage Learnings.
3. Gupta & Gupta Advance Electrical & Electronics Material, Wieley India.
4. James F.Shackelford - Introduction Material Science for Enginnering Pearson.
5. V.Rajendran -Material science, TMH.
6. Engineering Materials: Kenneth G. Budinski, Prentice Hall of India, New Delhi
7. Material Science - Narula, Narula and Gupta. New Age Publishers

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Course Code	Course Name	Hours per Week			Total Credits
		L	T	P	
EI3CO15	Instrumentation Engineering Workshop	0	0	2	1

1. Study of various electrical components and their representation like Resistor, Capacitor, Inductor, Transformer, Fuse, Diode and its types, BJT, FET, MOSFET, SCR , wires etc.

2. Identification and analysis of different types of resistors like carbon composition, carbon film, cracked carbon, metal oxide film, wire-wound, variable resistors. Identification and analysis of various capacitors like paper, silvered paper, mica, silvered mica, ceramic plastic foil, electrolytic also identify various inductors fixed and variable inductors. Identification of values and other specifications like voltage rating, tolerance, temperature using color code and other information (like letter code) specified on the component. study of IC, types , analysis of the IC number, surface mount devices.

3. Study of Ammeter, Voltmeter and Watt meter. Use of multimeter for measurement of voltage, current, resistance, continuity, diode terminals, BJT testing etc. study of IC tester.

4. Study of CRO and its demonstration kit, Study of different types of probes.

5. Study of different transducers and sensors for the measurement of pressure, temperature, flow, level, displacement.

6. Study of simple experimental set ups for the measurement of physical signals like pressure , displacement etc.

7. Study of PCB , types , steps involved in manufacturing of circuits on PCB such as circuit design, PCB layout, drilling, etching, soldering etc.

8. Study and practice of soldering and de-soldering of electronic components on PCB. Types of soldering solder material solder flux. Soldering of SMD.

9. Develop a simple circuit on PCB for the measurement of some signal like temperature, force etc.

LIST OF BOOKS

1 Murthy, D. V. S. Transducers and Instrumentation PHI Learning.
2 Kalsi, H.S. Measurement Systems Mcgraw hill Publishers.
3 Bell, D.A. Electronic Instrumentation and Measurements PHI Learning.
4 Alan Winstanley , "The Basic Soldering Guide", Kindle Edition.
5 Raghbir Singh Khandpur., "Printed Circuit Boards: Design, Fabrication, and Assembly " , McGraw-Hill.